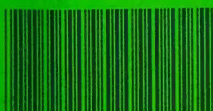


**** PRELIMINARY OPERATING MANUAL ****

Model 1030 SIGNAL GENERATOR

150 kHz TO 180 MHz

MP MASTER



MA24269

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1.0 General . The model 1030 signal generator is a general purpose AM/FM/PM fully programmable signal generator for laboratory and production testing of receivers , RF amplifiers , and components . It provides a spectrally pure source of RF at a precise level with low distortion , wideband modulation . All functions are controlled by an efficient keyboard style front panel or by the IEEE-488 general purpose interface bus (GPIB) .

1.1 Special Features .

- * high RF output level of +23 dBm over full frequency range .
- * RF output level programmable in 0.1 dB steps
- * low non-harmonic spurious output
- * preset or user defined frequency step size
- * repeating step key or digital knob tuning
- * free format for number input , fixed or floating
- * very low distortion FM
- * true phase modulation
- * low distortion AM
- * very low distortion variable frequency modulation oscillator , 20 Hz - 50 kHz .
- * programmable modulation oscillator output level
- * recall of up to 250 complete instrument setups from non-volatile memory .
- * single key stroke recall of consecutive setups
- * analog sweep with intensity marker
- * digital sweep
- * return of function arguments via interface bus
- * built-in test routines
- * detailed error identification by number

2.0 Power Requirements . The 1030 requires a source of 100 , 120 , 220 or 240 volts $\pm$ 10 % , 50 to 60 Hz , and consumes approximately 100 watts . To select the proper line voltage range , set the two line voltage selector switches located on the rear panel as follows :

nominal line voltage	100/120 switch	120/240 switch
100	100	120
120	120	120
220	100	240
240	120	240

2.1 Line Fuses . There are two line fuses located on the rear panel . The following table indicates the proper size for the various line voltages .

nominal line voltage	(p) fuse type	(s) fuse type
100/120	2 a	0.5 a mdl
220/240	1 a	0.25 a mdl

2.2 Standby Power Supply . The standby power supply is not controlled by the front panel power switch and is active whenever line power is connected .

The purpose of this supply is to keep the reference oscillator crystal oven at operating temperature and to retain valid data in the random access memory .

2.3 Battery Power Supply . The battery power supply is active only in the absence of line power and its only purpose is to retain data in the RAM . The battery is a primary lithium cell , 3.0 v , 150 mah . The expected life in average use is five years .

2.4 Power Fail Protection . When the line voltage drops more than ten percent below nominal , the power fail protection circuitry automatically isolates the RAM and transfers to battery power . Simultaneously the display shows the [Lo Line] message and all internal processes stop . Normal operation will resume when the voltage is restored . All conditions which existed before the event (except remote mode) will be re-established . If during the restart process another power failure occurs , the computer will discard the previous data and perform an initialization restart . (see initialize function)

2.5 Initial Power Up . Determine the proper line voltage switch settings and fuses from sections 2.0 and 2.1 and verify correct setup . Connect the line cord and place the power ON/STANDBY lever switch in the ON position . After a two second delay the display should contain all dashes for a period of three additional seconds , followed by normal data . When data appears , press the init key . this will cause the dashes to reappear for three seconds , followed by this display :

0. Hz Dev	100.00000 MHz	0.0 dBm
[MODULATION]	[FREQUENCY]	[LEVEL]

The red indicator on the FREQ key should be on . All other indicators are dark . The INIT function sets up the 1030 to a predetermined state . The following table contains a description of the initialized state :

table 2-1. Initialized State

Sig/Swp Gen Mode - SIG GEN MODE	Remote/Local - LOCAL
Frequency 100.00000 MHz	FM Deviation 0 kHz
PM Deviation 0.00 rad	RF Output Level 0.0 dBm
Mod Oscillator Freq 1.00 kHz	Mod Oscillator Level 1 Vrms
AM depth 0 %	Freq Step Size 0 Hz
Level Step Size 0.1 dB	Knob - OFF
RF ON/OFF - OFF	FM/PM Source - OFF
AM Source - OFF	SRQ - CLEARED
Read OPTION Switch for EOS , EI/DI and Z5/Z7 select	
Read AUX Connector for SWEEP RATE - R0 is default condition .	

2.6 Entering A Frequency .

Press the FREQ key . The led will come on to indicate that the frequency function is active . Only one primary function can be active at one time , and the frequency function will remain active until a different primary function is selected .

Any frequency within the range of the 1030 may be entered from the keypad using any consistent combination of numbers and units . For example , to enter 82.150000 MHz , press the (8) key and the frequency display will change to show an (8) in the right-most position and a tick (') mark to the left of the (8) . The (') always indicates that the number displayed has not yet been entered . As the successive digits are entered , each will appear in the right-most position with the previous digits left shifted . After entering 8 2 . 1 5 , the display will contain ['82.15] . Now press the MHz key to complete the number and enter it . It is not necessary to enter any trailing zeroes , nor is it necessary to press the enter key if a units key is used . While this is the most efficient way to enter 82.15 MHz it is equally valid to enter 8 2 1 5 0 kHz or 8 2 1 5 0 0 0 0 ENTER .

If at any time prior to entry , the wrong digit is entered , press the CLR key to clear the input . This will restore the previous (current) frequency display .

Subsequent new frequencies may be entered without pressing the FREQ key each time . The function keys are used only to change the primary active function .

After entering 82.15 MHz , press the kHz key . This will produce the display [82150.00 kHz] . Now press the GHz key and get [0.0821500 GHz] . The display program will rescale the number to the requested units if possible ; otherwise , the request is ignored .

2.7 Controlling RF Output Level

Press the RF LEVEL key . The led will come on to indicate the RF level function is active . Output level may be input in units of power (dBm) , voltage (uv , mv , v) or log voltage (dBuv) . Voltage units may be referenced to 50 or 75 ohm systems . (see sect on option switch)

For example , to enter -46.5 dBm press the - 4 6 . and 5 keys . The LEVEL display will contain [-46.5] .

Press the dBm key to complete the entry .

The specified level of -46.5 dBm will appear at the output type-N connector only if the RF on/off control is ON .

RF ON/off is an alternate action key . When the led is on , the indicated RF level is present .

To convert the value in dBm to equivalent voltage across a 50 ohm load (or 75 ohms) , press any voltage units key . Because of display length limitation , the displayed units are selected by the computer for optimum resolution . In this example the power level -46.5 dBm will be converted to its voltage equivalent across 50 ohms , 1.05 mv . Press the dBuv key to express this as 60.5 dB above 1 uv . Press the dBm key to restore the -46.5 dBm indication . A level may be entered in voltage units initially and displayed at any point as a voltage , decibel voltage or power level . There are no restrictions when converting back and forth .

2.8 Controlling Frequency and Phase Modulation .

The FM and PM functions share the same circuits and are therefore mutually exclusive . When the FM or PM key is pressed , an internal flag is checked to determine if a function change has occurred . If so , the argument value is cleared to zero ; otherwise , it remains unchanged .

FM deviation is entered after pressing the FM key in the same manner as frequency . PM deviation has units of radians and is entered by use of the ENTER key . The ENTER key serves as a multipurpose units key including Hertz , radians , percent , dBm , and dimensionless numbers .

Entering a value for deviation does not control the modulation source . This is accomplished with the FM/PM source selection keys . The OFF key disconnects all inputs to the modulator and produces minimum residual modulation . The INT key selects the internal modulation oscillator as the source with the specified deviation . the EXT key selects the external source connector input with a sensitivity of the specified deviation per volt rms . Therefore , for calibrated external source modulation , an input level of 1 volt rms (sinewave) or 2.828 volts peak to peak (non-sinusoid) is required .

2.9 Controlling Amplitude Modulation

Press the AM key to make the AM function active . AM depth is entered in the same manner as radians , using the ENTER key to complete the entry .

The modulator source selection is the same as FM/PM source selection using an identical set of keys .

2.10 Controlling Modulation - General

The AM and FM/PM source selection keys may be operated at any time . It is not necessary for AM or FM/PM to be the active function in order to change sources .

Simultaneous AM with FM or AM with PM using any combination of sources is permitted .

2.11 Controlling the Internal Modulation Oscillator .

The modulation oscillator provides a fixed internal level for driving the AM and FM/PM modulators and an independent variable level output signal . Press the mod FREQ key to make modulation oscillator frequency the active function and enter the desired frequency in the same manner as for the carrier frequency .

Press the osc LEVEL key to make oscillator output level the active function and enter the desired level in voltage units . This parameter affects only the level at the oscillator output connector . It has no effect on the internal modulation function .

The output level displayed is the source level behind 600 ohms impedance (open-circuit voltage) . When terminated in 600 ohms the voltage appearing across the load will be half the indicated value .

2.12 Setting the Bus Address .

To set the GPIB listen/talk address , press the bus ADRS key . Enter the address and use the ENTER key to complete the entry . Bus address is not affected by initialization or clear functions and is modified by the computer only if it contains an invalid number .

2.13 Using Step-up and Step-down - Frequency Functions .

The freq step function applies to all functions which have a frequency argument . There are two ways to set the size of the increment : (1) by pressing the desired freq step size PRESET key or (2) by entering a value into the freq step function . The preset keys may be pressed at any time without regard for which function is active . To select a step size not available on the preset keys , press the [ΔF] key to make it the active function and enter the desired step size in the same manner as any other frequency . After completing the entry , press the function key corresponding to the function to be stepped . From this point on , each time the step-up key [$\wedge$] is pressed , the function argument will be incremented by the step size . Holding down the step-up key will produce a single increment , followed by a one second delay , followed by repetetive increments until the the key is released . The step-down key works the same way for decrementing the argument .

2.14 Using Step-up and Step-down - Level and misc functions

For functions which do not have frequency for an argument a separate step size is maintained . This capability is primarily intended for RF output LEVEL control . This step size is selected by the level step PRESET keys . These keys are calibrated in dB increments for RF output level in the power units mode . When in the voltage units mode , the actual step size will still be in dB resulting in an equivalent voltage step factor . Thus , in the voltage case , the step function will appear to multiply the level by a factor each time rather than to add an increment .

The level step sizes also can be used with the mod osc level , AM and FM functions ; however , the key nomenclature does not correspond to the increment size . The 0.1 key will increment the least significant digit of the display ; the 1 key will increment next significant digit ; etc .

The step size , bus address , and store program functions cannot be incremented . The RECALL program step size is always one .

2.15 Using the Knob .

The knob is a digital device which works in conjunction with the step function to simulate the action of a conventional tuning control or potentiometer . The knob is turned on and off with the alternate action KNOB key .

When turned on , the knob functions as follows :

- (1) Frequency functions - the knob uses the same step size as the step-up/step-down controls .
- (2) AM , PM and level functions - the knob steps with the least significant increment without regard to the selected step size .
- (3) Freq step , bus address , prog store , prog recall - the knob does not operate with these functions .

2.16 Storing and Recalling Programs .

The entire status of the instrument can be saved by program location in the non-volatile memory for recall at a later time . Storing a new program writes over any existing program saved at the same location .

To save the complete front panel setup in the program memory , press the pgm STO key to make the function active . The display will contain the program location most recently referenced . Key in the location number desired and press ENTER . The program will be saved at the specified location and the active function will automatically change to pgm RCL . The pgm STO key must be pressed each time a program is saved .

To recall a setup previously saved , press the pgm RCL key . The recall function will be set active and the most recently referenced setup will be restored . If a different stored setup is desired , simply enter its location number and press ENTER .

After a setup is recalled it is often necessary to vary one or more of the parameters using the setup value(s) as a starting point . To reset everything to the setup values , simply press the RCL key .

If the step-up or step-down key is pressed , the next or preceeding complete program will be recalled . (assuming such programs have been stored) . In this way a sequential test procedure can be implemented .

In normal use the memory is never erased . New programs or changes are simply written over old ones . It is possible to erase the entire program memory by use of the TEST switch inside the instrument . Erased program locations cannot be recalled ! A program must be stored at each location before it can be recalled .

2.17 Service Request (SRQ)

The SRQ key is used to request service via the IEEE-488 bus (GPIB) . Pressing the SRQ key causes the bus SRQ line to be set and held true until :

- (1) the CLR key is pressed , or
- (2) a serial poll is executed

The SRQ status indicator will be on when the SRQ line is being held true .

2.18 Initialize (local)

The INIT key performs both the initialize and return-to-local functions . In the local mode press the INIT key to set every function to a known state . Table 2-1 lists these conditions .

In the remote mode press the INIT key to force a return to local mode . The local mode is immediately restored without regard for the status of the bus handshake lines or address states . This permits escape from a bus hang-up condition or other fault . The return-to-local function of the INIT key may be temporarily disabled by sending the universal bus command local lockout (LLO) . LLO is cleared when the REN line goes false .

2.19 Errors

The internal computer prevents out-of-range numbers and illegal commands from reaching the control system . It simultaneously restores the previous valid conditions and the message [Error ##] appears in the center display . By referring to the table of error codes one can determine the nature of the mistake . The error message can be cleared with the CLR key or by entering valid data .

Error message numbers 1 - 27 refer to illegal input data or format errors , i.e. soft errors . Error message numbers 30 - 36 , & 50 refer to hardware malfunctions which require service . Even if the error can be cleared , an abnormal condition exists and should be corrected .

For remote operation the occurrence of an error can assert the bus SRQ line (if enabled) .

If the controller executes the serial poll upon receipt of SRQ , the 1030 will return the error message number plus decimal 64 as the status byte . Alternatively , if the controller addresses the 1030 to talk in the TS (Talk Status) mode , the error message number will be returned as a numeric string . Unlike the local mode the remote mode will not accept further data until an error is cleared by a serial poll or by sending the CL mnemonic . This ensures the validity of the controller's assumptions regarding the state of the 1030 .

2.20 Analog Sweep

The red SWP key is an alternate action key which changes between the sweep generator (led on) and the signal generator modes . Setting the sweep generator mode will will turn off the modulation sources and set the frequency function active .

A 10 v p-p ramp with intensity marker pause will appear at the modulation oscillator output BNC connector(s) for sweeping the external display device . For most applications it will not be necessary to use the gate or marker blanking signals available at the rear panel auxiliary connector .

The swept RF signal appears at the RF OUT connector and is controlled by the RF on/off and output LEVEL controls just as a CW signal . The frequency entered via the frequency function becomes the marker frequency . There are three sweep widths selected with the red SWP 1 , SWP 2 , and SWP 3 keys .

(The level step selected while in the signal generator mode is not disturbed by the sweep mode use of these same keys .)

Key	Sweep	Marker Posn	Typ fixed width
SWP3	narrow	center	+ - 600 kHz @ 100 MHz
SWP2	medium	center	+ - 1.2 MHz @ 100 MHz
SWP1	wide	variable	approx 10% Fc, 2.1 - 180 MHz

In the narrow modes the intensity marker appears at the center of the display and coincides with the frequency entered into the frequency function . The frequency step and knob controls may be used in the normal way . In SWP2 and SWP3 , only the sweep width can be made variable by coupling to the internal FM mode . After entering the sweep generator mode , press the FM INT key . The peak deviation entered into the FM function will control sweep width . The total (+ -) width will be two times the peak deviation . With the FM source OFF , the sweep width will go to the maximum value for the frequency range and sweep mode in use .

In the wide mode the swept band is selected by the control program to include the marker frequency . The actual position of the marker may be anywhere across the display .

The accuracy of the marker position is greatly enhanced in either SWP2 or SWP3 . For best accuracy , locate the region of interest using the wide mode and then change to a narrower mode for accurate frequency determination .

2.21 Slow Analog Sweep .

This feature is intended for use with network analyzers and other similar devices which cannot follow the high sweep rate and fast retrace of normal analog sweep . Three slower sweep speeds are selectable via pins 13 and 14 of the rear panel AUX connector . The connector pins are sensed by the microprocessor during power up and Device Clear . The AUX connector selection may be overridden temporarily by the R0 - R3 bus mnemonics . Variable width can also be used at the slower rates . The slower analog sweeps may not be useful unless the display device has storage capability . The flicker factor is too high for comfortable viewing on a non-storage oscilloscope , and the sweep rate is too fast for most electro-mechanical x-y plotters .

2.22 Digital Sweep - Manual operation

Digital sweep provides a means to automatically increment carrier frequency from a specified start frequency to a specified stop frequency in specified steps . At the same time it provides a scaled voltage ramp of fixed amplitude for use with an x-y plotter . It is necessary to make use of a program location even if storage is not required . It does not matter which program location number is used . The digital sweep mode is set up as follows :

- 1) Enter a start frequency and delta-F (step size) in the usual manner .
- 2) Set the RF output LEVEL and RF ON .
- 3) Store this setup in any desired location using the normal " STO # ENTER " sequence .
- 4) Enter the frequency which is to be the upper limit of the sweep . This frequency must be larger than the start frequency and allow for at least 16 , but not more than 4095 total steps .
- 5) Press the store (STO) key followed by the sweep (SWP) key . If para 4) is not met , an error message will appear ; otherwise , the system will enter the digital sweep mode and the flashing message [Strt Fr] , start frequency will appear in the frequency display .

The flashing [Strt Fr] message alternates with the value of the start frequency and indicates that the digital sweep mode is active . To initiate a sweep press the SWP (sweep) key . The carrier frequency will be incremented by the value previously stored in delta-F and displayed . The flashing message does not appear during the actual sweep . Simultaneously , a voltage ramp scaled between zero and 10 volts appears at the modulation oscillator outputs . This signal may be used to drive the x-axis of an x-y plotter .

!! ONLY PARAMETERS WHICH ARE STORED IN THE PROGRAM
LOCATION WILL REPEAT ON SUBSEQUENT SWEEPS !!

To change the stop-frequency it is only necessary to enter a new value and press " STO SWP " . Subject to the limitations previously noted , the new digital sweep will be written over the old one in the current program location . To change start-frequency or step size , and maintain correct scaling , is necessary to repeat the entire sequence as shown before .

Any value entered into the modulation oscillator level function will temporarily produce a related d.c. level at the mod osc outputs . 4.095 volts entered into the function will scale to 10 volts d.c. out . In this manner , the x-axis of the plotter can be scanned manually . The KNOB and step-up / step-down controls operate in the usual way in this situation . When a sweep is started , the ramp will always begin at zero volts . During sweep , keyboard controls will not respond . Only the INIT key is active , and it may be used to abort an undesired sweep . Pressing the INIT key will result in initialization , stopping the sweep and producing pen lift and retrace . To get back the original setup , recall the program affected .

2.23 Digital Sweep - IEEE-488 bus

Digital sweep may be invoked over the IEEE-488 bus interface in exactly the same manner as manual operation . The "STSW" mnemonic pair forms a macro-command to set the upper limit or stop frequency and the digital sweep mode . Single sweeps are initiated by sending the "SW" mnemonic . The time/step is selected by the R0 - R3 mnemonics . The fastest mode , R1 , can be made approximately 25 % faster than is possible in the manual mode by blanking the display .

Then disadvantage of this method is that it puts the IEEE-488 bus on hold (NRFD) during the entire sweep . In some cases this may be tolerable .

A more flexible and useful method is to explicitly program the sweep step-by-step . By setting the modulation oscillator frequency to zero , the modulation output becomes a d. c. level proportional to the value of the mod LEVEL function . As the mod level value varies from 0 to 4,095 mv , the d.c. output varies from 0 to 10 v . This forms a programmable 12 bit d-a converter which can be used to position the x-axis of a plotter to any desired position in any sequence . Combining frequency and ramp control with the

Time/step may be selected from one of four pre-set values between 100 and 800 msec/step via pins (13) and (14) of the rear panel AUX connector . The selection may be temporarily overridden by use of the R0 - R3 mnemonics on the IEEE-488 bus . (see sect. 2) After one complete sweep , the frequency will return to the start along with the ramp , and the flashing [Strt Fr] message will resume . Another sweep may be initiated by pressing the SWP key .

Pen lift signals of both the dot and gate types are provided . (The dot type is not available on R1) The gate type lowers the pen at the start of sweep and lifts it at the end , just before reset . The dot type lowers the pen at each step , allowing for a short settling time to remove transients produced by either the signal generator or the UUT . Both types are available at both active high and active low logic levels (TTL) at the rear panel auxillary output connector .

As a consequence of using a stored program location , the digital sweep setup is stored as any other setup and any subsequent recall of this location will re-establish the same parameters . There is no limit to the number of program locations which can be used in this manner .

Once the signal generator has been placed in the digital sweep mode either by direct setup or by recalling a previous setup , it will remain in this mode , blocking access to analog sweep , until one or more of the following events :

- 1) The clear (CLR) key is pressed .
- 2) A program not in digital sweep mode is recalled .
- 3) Initialize or device clear or CL is sent .

The CLR key will still remove errors and incomplete input just as before without disturbing digital sweep ; but if neither of these is present , it will cancel the digital sweep mode and analog sweep will be accessible . The digital sweep mode is always identified by either the flashing message or a sweep in progress .

While in the digital sweep mode , but not actually sweeping , all controls except AM , FM/PM , and their related source switches may be used . The effect of any settings will be temporary and exist for only one subsequent sweep , after which the original stored conditions will be re-established .

pen up and pen down functions allows the synthesis of any type of frequency sweep desired .

2.24 Remote Operation

The 1030 is placed in the remote mode by addressing it as a listener with REN true . In the remote state the keyboard is disabled except for the INIT/LOCAL key and the ON/STANDBY switch , and the REM indicator will be on .

The 1030 will return to the local mode :

- (1) If the INIT/LOCAL key is pressed and local lockout (LLO) is not active .
- (2) If go-to-local (GTL) bus command is sent .
- (3) IF REN is set false .

The 1030 must be placed in the remote mode in order for it to store and respond to data messages . It is not possible to store data in the local mode for execution in the remote mode .

2.25 Triggered Operation

When remoted the 1030 may operate in the immediate , IM , or wait-for-trigger , WT , modes . The immediate mode is the default condition and results in the complete execution of each instrument instruction as it is interpreted in the input buffer . The wait-for-trigger mode causes the final execution of instructions to be deferred until the receipt of a trigger . This aids in synchronizing 1030 state changes to the measurement system .

The mode is set when the WT mnemonic is encountered in the input string . From that point on control bytes are calculated and stored , but not executed . No change in the instrument state will occur until one of the following events .

- (1) Group execute trigger (GET) is received
- (2) The mnemonic trigger (TR) is interpreted
- (3) Any mnemonic following immediate (IM) is interpreted
- (4) Return to local

Events (3) & (4) also terminate the wait-for-trigger mode and restore the immediate mode .

The wait-for-trigger mode is NOT active in local .

2.26 Talk Operations

The 1030 can be addressed as a talker without regard for remote - local mode . When the talker active state is set by the bus controller , the 1030 sends a character string which is determined by the current talk mode . One of five different talk modes is selected by sending the appropriate mnemonic with the 1030 addressed as a listener . The selected mode will remain in effect until changed .

table 2- 1030 Talk Modes

Status (TS)	- If error is set , the error number is returned as a string . zero is normal status .
Value (TV)	- The argument of the active function is return -ed as a string . All values are in basic units i.e., Hertz , dBm , % , etc , except RF output level voltage which is in microvolts
Learn (TL)	- A compressed parameter string of 79 characters the last of which is always the ASCII '\$' . This string can be sent back to the 1030 to restore the exact state which defined it . The learn string must be sent as a complete line without alteration . When the '\$' character is encountered in the input buffer , the learn mode is automatically activated . While this form provides a compact and fast method to save and restore settings , it bypasses much of the error control of the 1030 and therefore must be used with caution .
Fn (TF)	- The function mode returns a string of five characters which indicate the state of all instrument functions . The bit assignments are arranged to allow for string or byte oriented decoding .
Prog (TP)	- The program mode returns a six digit number which uniquely identifies the firmware .

table 2- 1030 Talk Mode TF byte map

(All bytes are equivalent to ASCII characters 0 thru ?)

	Bit	Posn	7	6	5	4	3	2	1	0
Char 1			0	0	1	1	XF	UL	IA	IF
Char 2			0	0	1	1	XA	KN	SW	RF
							XF - External FM		IF - Internal FM	
							XA - External AM		IA - Internal AM	
							KN - Knob ON		RF - Carrier ON	
							SW - Sweep Mode		UL - Unlocked	
Char 3			0	0	1	1	F3	F2	F1	F0

ASCII	FUNCTION	ASCII	FUNCTION
0	Mod Frequency	6	Store Program
1	FM	7	Recall Program
2	FM	8	RF Output Level
3	AM	9	Step Size
4	Frequency	?	Mod Osc Level
5	Bus Address		

TABLE 2- (CONTINUED)

Char 4	0	0	1	1	DS	AF	S1	S0
DS - digital swp	AF - analog fast	0 - SW3	1 - SW2	2 - SW1				
Char 5	0	0	1	1	0	L2	L1	L0
0 - L0	3 - L1	6 - L2						

2.27 End-of-string (EOS) Control

Several end-of-string options are provided to accommodate a wide variety of controllers . The 1030 always terminates on EOI true (end-or-identify line of the GPIB) and always sends EOI true with the last character of every string . In addition CR , LF , or CRLF may be used . The use of CRLF is selected via switch positions 1 and 2 of the OPTION switch A6S2 located at the top edge of the I/O Assembly A6 . For almost all applications , position 00 (both S2-1 and S2-2 Closed) will be appropriate .

End-of-String (EOS) Selection via A6S2

		Terminates	Sends
A6S2-1	A6S2-2	as LISTENER	as TALKER
CLOSED	CLOSED	LF OR CRLF	CRLF
OPEN	CLOSED	CR	CRLF
CLOSED	OPEN	CR	CR
OPEN	OPEN	LF	LF

The setting of A6S2 has NO effect on the operation of EOI .
Note : CRLF is also called 'New-Line' or NL

2.28 Using Service Request (SRQ) for Error Control .

The 1030 may be configured to set SRQ true when remote and an error occurs . This feature is enabled by setting switch 4 of the OPTION switch A6S2-4 open , or by sending the mnemonic EI (enable interrupts) . The bus controller must be programmed to respond to SRQ true . In the usual case the controller then executes a serial poll of the bus devices to determine which caused SRQ to be true . If the 1030 is the requesting device it responds to the serial poll with a single byte which expresses the error code number in excess sixty-four . The serial poll will clear the SRQ line automatically . The poll byte takes on the following values :

SERIAL POLL STATUS BYTE			INTERPRETATION
0	Decimal	0 Hex	 1030 is not requesting device
64		40	 Panel SRQ key request
65		41	Error 1
66		42	Error 2
..		..	
94		5E	Error 30
..		..	
100		64	Error 36

*** APPENDIX ***

LISTEN / TALK ADDRESS (MLTA)

The primary listen / talk address is a decimal number between 0 and 30 inclusive . It is set using the front panel bus address function key and appears in the right-most display window . Secondary address is not implemented .

DEVICE CLEAR

The bus commands device clear (DCL) and selected device clear (SDC) result in an initialization sequence similar to that provided by the front panel init key , excluding the self-check sequence . MLTA is not affected .

*** OPTION SWITCH ***

switch #	S8	S7	S6	S5	S4	S3	S2	S1
name	Z	na	na	na	SRQ	AML	<- EOS ->	
Z (50/75 ohm ref.) : ON = 50 ohms , OFF = 75 ohms								
AML (16 dBm AM LIMIT) : ON = enabled , OFF = disabled								
SRQ (Errors set SRQ) : ON = disabled , OFF = enabled								
EOS (End-of String) :								
S1	S2	as LISTENER		as TALKER				
ON	ON	(CR)LF		CRLF		: NOTE : EOI always		
OFF	ON	CR		CRLF		: terminates strings		
ON	OFF	CR		CR		: in both LISTEN and		
OFF	OFF	LF		LF		: TALK .		

*** PRIMARY FUNCTIONS ***

(Functions which take numerical arguments)

MNEMONIC

- (FR) RF Output Frequency [150 kHz - 179.99990 MHz]
- (SZ) Frequency Step Size [0 - 16.77215 MHz]
- (FM) FM Deviation [0 - 600 kHz peak]
- (PM) PM Deviation [0 - 16.00 radians peak]
- (MF) Modulation Oscillator Frequency [20 Hz - 50 kHz]
- (AM) AM Depth [0 - 99.9 %]
- (OL) Output Level [-142.9 to +23.0 dBm]
- [- 35.9 to +130.0 dBuV 50 ohms]
- [- 34.2 to +131.7 dBuV 75 ohms]
- [14 nV to 3.16 Volts 50 ohms]
- [18 nV to 4.74 Volts 75 ohms]
- (ST) Store current settings in Program Location [0 - 249]
- (RE) Recall Setup Stored at Location [0 - 250]
- (ML) Modulation Oscillator Output Level [0 - 4.095 V]

ONLY ONE PRIMARY FUNCTION MAY BE ACTIVE AT A TIME .

*** UNITS ***

MNEMONIC

(HZ)	Hertz
(KH)	kilohertz
(MH)	megahertz
(GH)	gigahertz
(DB)	decibel milliwatts
(DU)	decibel microvolts
(VO)	volts
(MV)	millivolts
(UV)	microvolts

NUMBERS NOT FOLLOWED BY UNITS ARE ASSIGNED DEFAULT UNITS .
 DEFAULT UNITS ARE Hertz , Percent , radians , dBm
 or dimensionless AS APPROPRIATE FOR THE ACTIVE FUNCTION .

*** MODULATION SOURCE FUNCTIONS ***

MNEMONIC

(XF)	External FM or PM Source
(IF)	Internal FM or PM source
(FO)	FM and PM off
(XA)	External AM source
(IA)	Internal AM source
(AO)	AM off

*** RF OUTPUT CONTROL ***

(ON)	Set RF Output On
(OF)	Set RF Output Off

*** STEP FUNCTIONS ***

MNEMONIC

(L0)	Output Level Step Size Preset	0.1 dB
(L1)	" "	1 dB
(L2)	" "	10 dB
(F0)	Frequency Step Size Preset	100 Hz
(F1)	" "	1 kHz
(F2)	" "	10 kHz
(F3)	" "	100 kHz
(SU)	Step Up	
(SD)	Step Down	

Frequency step sizes are loaded into the (SZ) function and are displayed as such . Output level step sizes are stored independently and do not affect (SZ) or the display .

*** ANALOG SWEEP FUNCTIONS ***

(S1) Set SWP 1 , Wide
 (S2) Set SWP 2 , Medium
 (S3) Set SWP 3 , Narrow

*** DIGITAL SWEEP FUNCTIONS ***

(PU) Pen Up
 (PD) Pen Down
 (MF0) Macro to set D.A. converter mode
 (STSW) Macro to store stop Freq and set DIGITAL SWEEP MODE

*** SWEEP RATE FUNCTIONS ***

	analog rep rates	digital time/step
	SW1 SW2 & SW3	
(R0)	40 Hz 61 Hz	500 mSec
(R1)	65 Hz 27 Hz	110 mSec
(R2)	8 Hz 10 Hz	250 mSec
(R3)	2 Hz 1 Hz	800 mSec

*** TALK MODE FUNCTIONS ***

(TS) Set TALK mode to return ERROR STATUS
 (TL) Set TALK mode to return a LEARN STRING
 (TV) Set TALK mode to return the active ARGUMENT
 (TP) Set TALK mode to return the firmware REF #
 (TF) Set TALK mode to return select FUNCTIONS

*** DISPLAY FUNCTIONS ***

(UD) Enable Front Panel Display
 (BL) Disable and Blank Front Panel Display

*** TEST FUNCTION ***

(CH) Frequency Control Loop Test . Sets Error .

*** TRIGGER MODE FUNCTIONS ***

(WT) Set the Wait-for-Trigger Mode
 (IM) Set the Immediate Mode
 (TR) Trigger (Alternative to Group Execute Trigger)

*** CONTROL ***

(CL) CLEAR Errors and SRQ
 (SG) Set SIGNAL GENERATOR mode
 (SW) Set SWEEP GENERATOR mode
 (UL) UNLOCK (DCFM)
 (PL) PHASE LOCK (Normal Operation)
 (EI) ENABLE SRQ function
 (DI) DISABLE SRQ function
 (Z5) Set 50 ohms RF Voltage Reference
 (Z7) Set 75 OHMS RF Voltage Reference

SWEEP RATE and CONTROL mnemonics overrule OPTION switch settings and AUXILIARY connector signals until INIT , DCL OR SDC .

*** NUMBER FORMATTING ***

- (1) Fixed or Floating 'E' or 'e' formats are accepted .
- (2) The optional + or - sign may precede the mantissa (significand) and/or the exponent .
- (3) The optional decimal point (radix) may appear at any position within the mantissa . A decimal point in the exponent is ignored .
- (4) ASCII characters having hex values 0 - 23 & 25 - 2C are ignored .

*** PROGRAMMING DATA STRING FORMAT ***

- (1) The programming sequence is in natural order i.e. , a function mnemonic is sent first followed by the argument if appropriate .
- (2) ASCII characters having the values 0 - 23 & 25 - 2C are ignored . The \$, (hex 24) is reserved .
- (3) A primary function mnemonic sent without a following argument will make the specified function active .
- (4) The programming data string may not exceed 128 characters and may be terminated with the LINE FEED , CARRIAGE RETURN , and/or EOL . (See OPTION switch EOS selection)
- (5) Interpretation of the data string does not begin until termination occurs .
- (6) If units are unspecified for any argument , default units are automatically appended . The functions (AM) , (PM) (ST) and (RE) always use default units .
- (7) If a units mnemonic is sent without a corresponding argument , the display will reflect any change providing :
 - (1) The units are appropriate to the active function otherwise , an error will result .
 - (2) The display is enabled .
 - (3) The display can accommodate the rescaled number otherwise , no change will result .
- (8) Errors are detected during interpretation . The occurrence of an error will display the Error Code (If the display is enabled) and set SRQ (If enabled) . The error (and SRQ) can be cleared by a SERIAL POLL or by a status request (TS) followed by the clear errors (CL) instruction . In either case the information identifies the error . All errors cause previous valid parameters to be restored . No new input will be processed until any existing error is cleared .

*** 1030 ERROR CODES ***

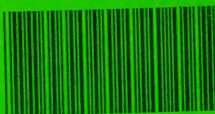
- (1) ILLEGAL MAIN FREQUENCY .
- (2) ILLEGAL FM DEVIATION .
- (3) ILLEGAL AM DEPTH .
- (4) ILLEGAL INTERNAL MODULATION OSCILLATOR FREQUENCY .
- (5) ILLEGAL STEP SIZE
- (6) ILLEGAL RF OUTPUT LEVEL in dBm or dBuV .
- (7) With AM ON , OUTPUT LEVEL is LIMITED to +16 dBm .
- (8) AM cannot be turned ON with OUTPUT LEVEL above +16 dBm .
- (9) The primary active function CANNOT be STEPPED .
- (10) ILLEGAL MOD OSCILLATOR OUTPUT LEVEL .
- (11) UNITS ERROR . Units DO NOT match primary active function
- (12) ILLEGAL PROGRAM NUMBER .
- (13) PROGRAM requested is EMPTY .
- (14) ILLEGAL LISTEN/TALK ADDRESS .
- (15) DISPLAY OVERFLOW . Too many characters entered .
- (16) NON-EXISTANT FUNCTION MNEMONIC .
- (17) ILLEGAL LEARN MODE string format .
- (18) I/O BUFFER OVERFLOW . Input string exceeds 128 chars.
- (19) FM Deviation is limited below 275 kHz carrier freq .
- (20) ILLEGAL RF OUTPUT VOLTAGE .
- (21) ILLEGAL PM DEVIATION .
- (22) PROGRAM is RECALL ONLY .
- (23) ILLEGAL SWEEP mode operation .
- (24) UNLOCK NOT AVAILABLE with SWEEP .
- (25) STOP-FREQUENCY cannot be LESS THAN START-FREQUENCY .
- (26) FEWER than 16 steps NOT ALLOWED .
- (27) MORE than 4095 steps NOT ALLOWED .

*** 1030 HARDWARE ERROR CODES ***
(maintenance action indicated)

- (30 - 36) Frequency control system non-recoverable error .
(50) Hardware arithmetic error .

The Error Code as shown above will appear in the center display and will be returned by the TALK-STATUS function if executed . The SRQ STATUS BYTE will consist of the above code expressed ' excess sixty-four ' . The status code 64 DECIMAL means the SRQ was activated by the front panel SRQ KEY rather than by an error .

MP MASTER



MA24269